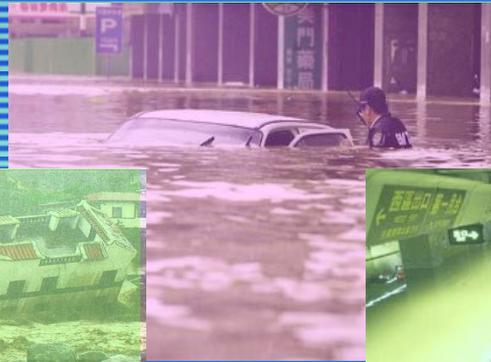


How we have a “Safe Taiwan” by enhancing capacity and capability at SAFE local levels on disaster reduction

- A Balance between Policy, Development and Technology



*Prof . Liang-Chun Chen
Director of NCDR*

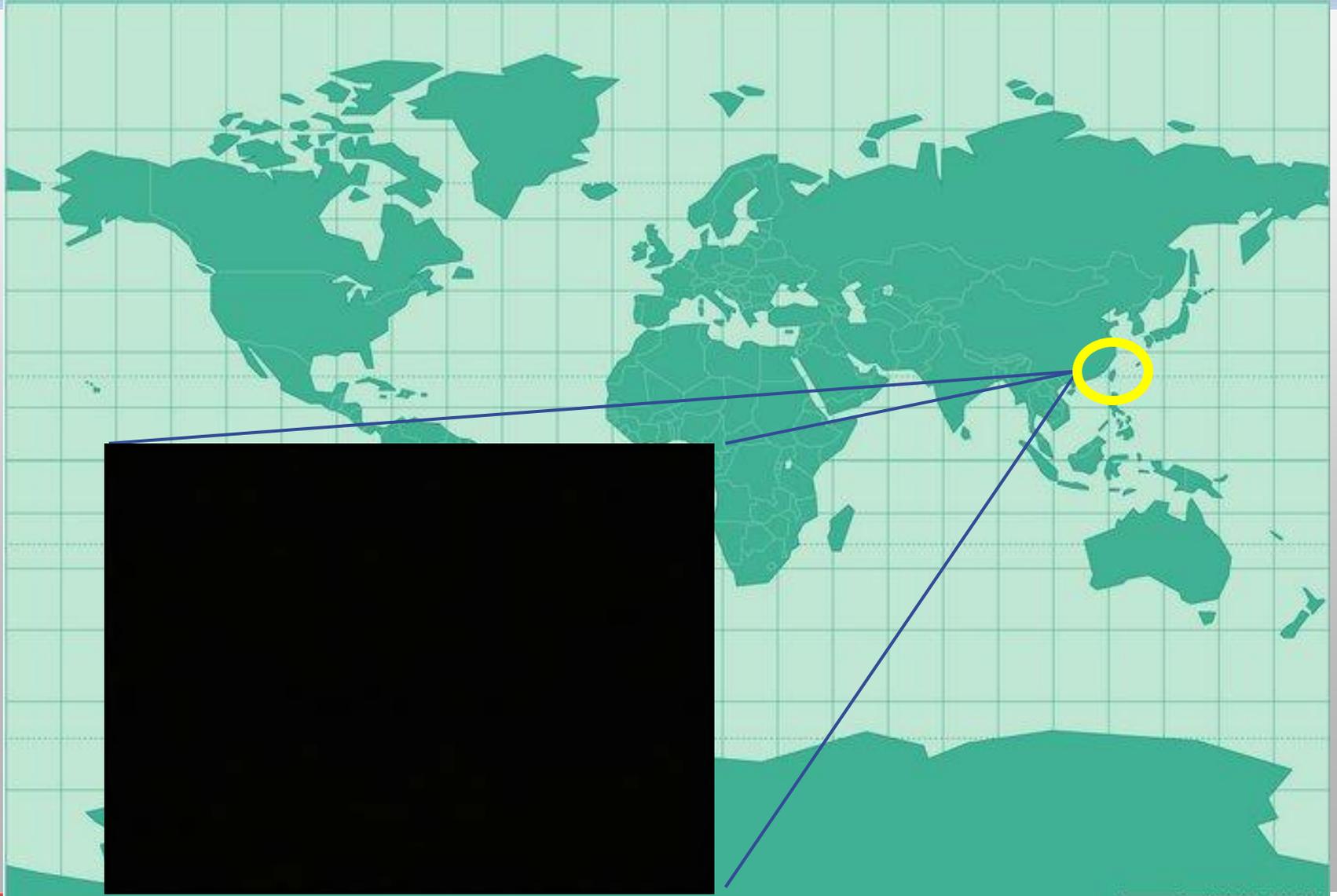
Outlines

- **Disaster Profiles of Taiwan**
- **Development and Framework of disaster management in Taiwan**
- **Project 1: Assist local governments**
- **Project 2: Community-based strategy**
- **Recent development in technology**
- **Conclusions**

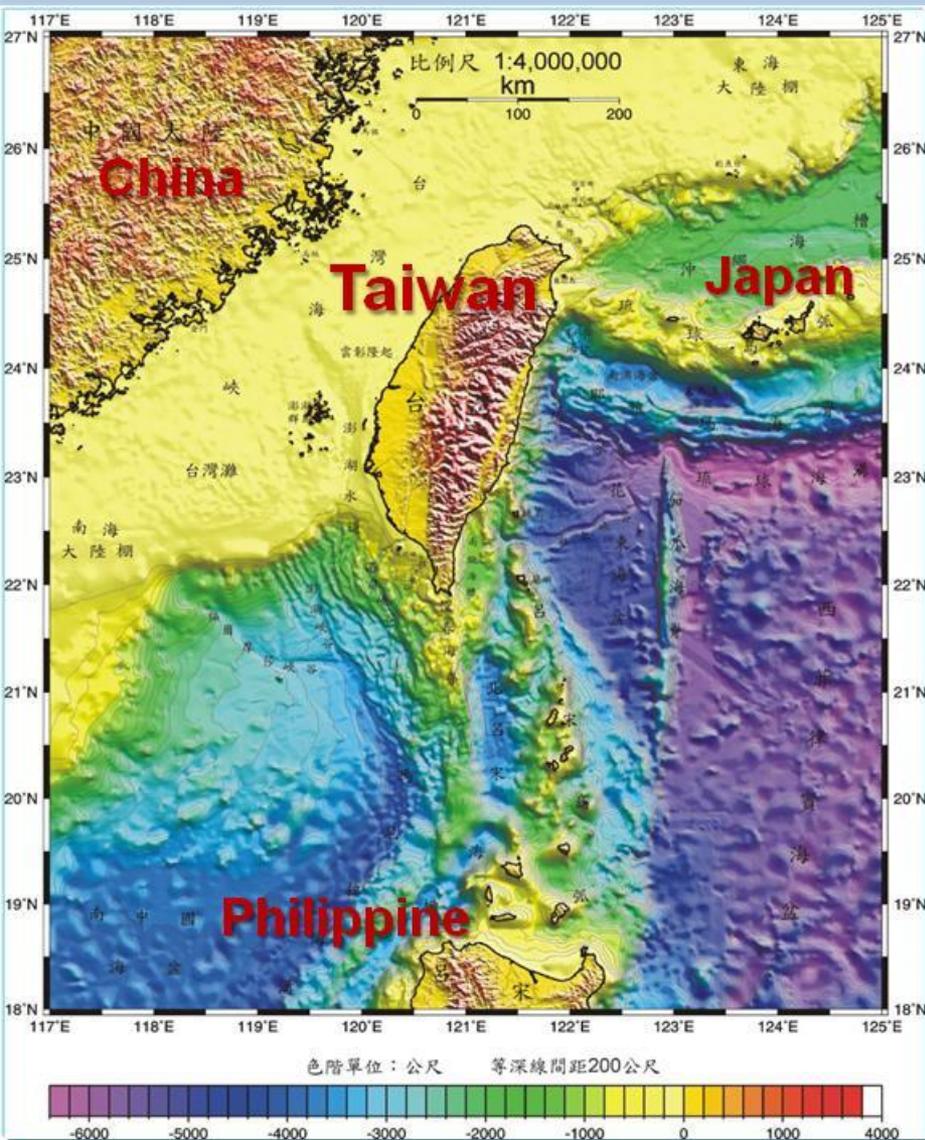
Disaster Profiles of Taiwan

-Learn from disasters

Where is Taiwan?

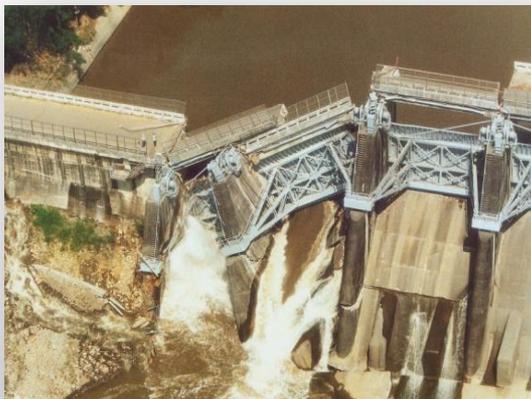


Basic Information of Taiwan



- **Geographic features**
 - 400 km from north to south
 - 145 km from east to west
 - Area: 36,000 Km² over 70% in slopeland
- **Population (in June, 2006)**
 - 22,900,00 in total, 67.70% in urban areas
 - Density: 633/ Km² , only lower than Bangladesh
- **Tectonic Conjunctions:**
 - Philippine Sea plate
 - Euro-Asia Plate
- **High risk of tropical cyclones**
 - 3.6 typhoons/year

Lessons from Natural Disasters in Taiwan



Earthquake



Landslide



Typhoon



Flood



Debris flow

In Taiwan, we live with natural disasters

Countries Most Exposed to Multiple Hazards

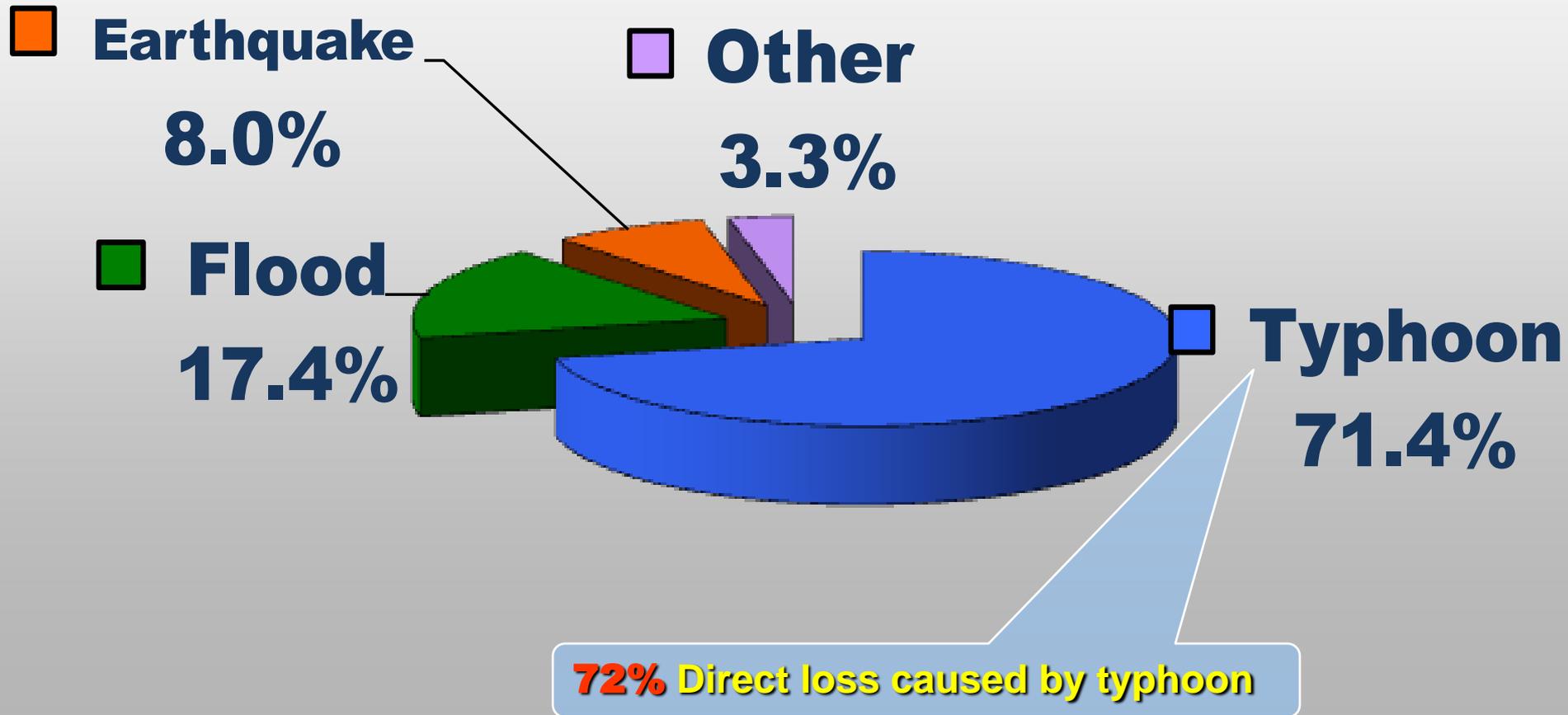
Three or more hazards (top 15 based on land area)

<i>Country</i>	<i>Percent of Total Area Exposed</i>	<i>Percent of Population Exposed</i>	<i>Max. Number of Hazards</i>
Taiwan	73.1	73.1	4
Costa Rica	36.8	41.1	4
Vanuatu	28.8	20.5	3
Philippines	22.3	36.4	5
Guatemala	21.3	40.8	5
Ecuador	13.9	23.9	5
Chile	12.9	54.0	4
Japan	10.5	15.3	4

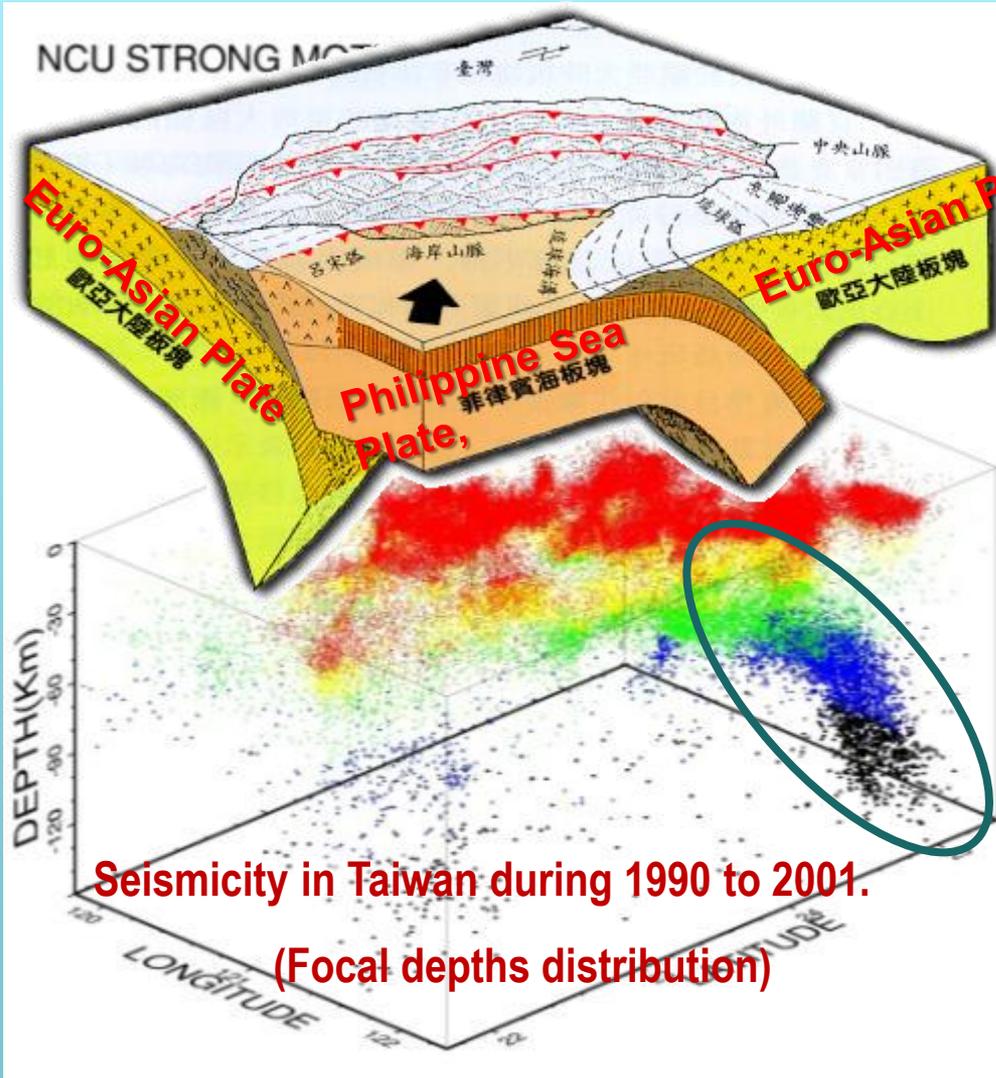
Source: World Bank, 2005

Losses Analysis of Natural Disasters

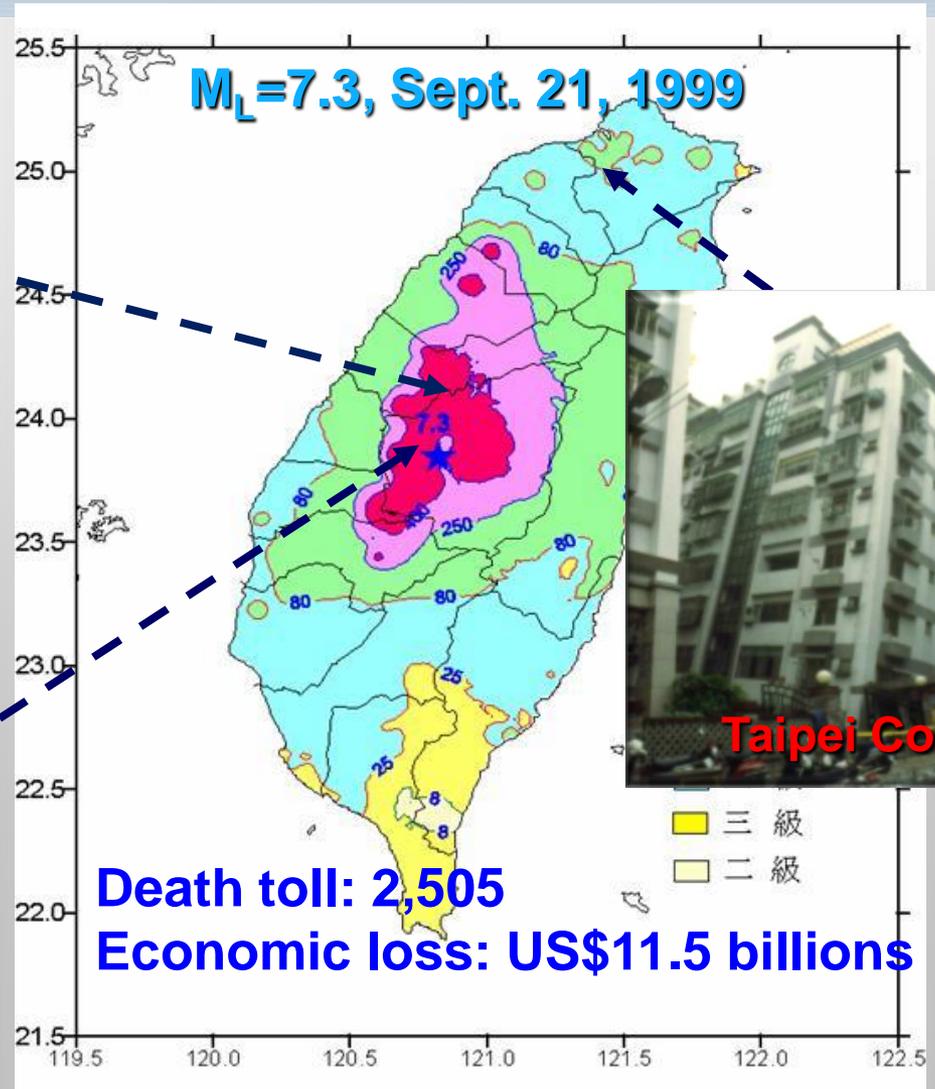
Total loss due to natural disasters



Seismicity and Active Faults in Taiwan



1999 Chi-Chi Earthquake



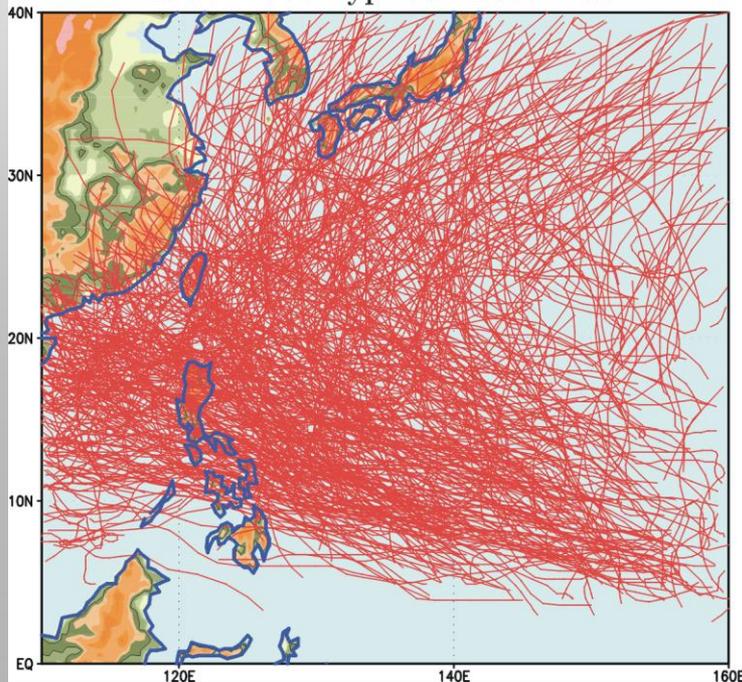
1999 Chi-Chi Earthquake



Losses of Typhoon in Taiwan

- In average, there are 3.6 typhoons Taiwan every year
 - In 2001, 8 typhoons attacked
 - In 2004, 6 typhoons swept
 - In 2005, 3 category-4 typhoons
 - In 2006, 7 typhoons swept
 - In 2007, 5 typhoons swept

1980~2003 Typhoon Best Track



Typhoon	Death	Injure	Agri. Loss (\$US M) (A)	Constr. Loss (\$US M) (B)	Total (\$US M) (A+B)
Chebi	30	124	22.3	0.7	23.0
Trami	5	-	2.2	4.9	7.1
Toraji	214	188	235.7	170.6	406.4
Nari	104	265	126.5	56.7	183.1
Utor	1	6	2.9	7.6	10.5
Total	354	583	389.6	240.5	630.1



Debris flows and urban flooding have become the most severe hazards in Taiwan area during typhoon season.



Historical Flood Disaster

In Taipei Downtown,
subway and main streets
were flooded.



Taipei MRT

**Typhoon Nari
(2001)**

Debris Flow Disaster

2004, Central Taiwan

敏督利颱風松鶴部落土石流災害

1,080位居民撤離，68棟房屋毀損，1人死亡。



資料來源：中興大學水保系

Debris Flow Disaster



Findings from past events

The four essential issues

1 Legislation

Specific Law will help to conduct all necessary measures, policies and plans for reduction, preparedness, response and recovery.

2 Teamwork

Cooperation and collaboration from inter- and intra- government sectors will be the solid foundation to implement designed plans..

3 Bottom-up

Local government and community need the empowerment from central government and require a well-defined regional plan.

4 Technology

Academic supports and research results with practical concerns and fulfilled implementation will provide the best reference of policy making.

Framework and Cores for Disaster Reduction in Taiwan

From Central to Local with
Technology, Science and Management

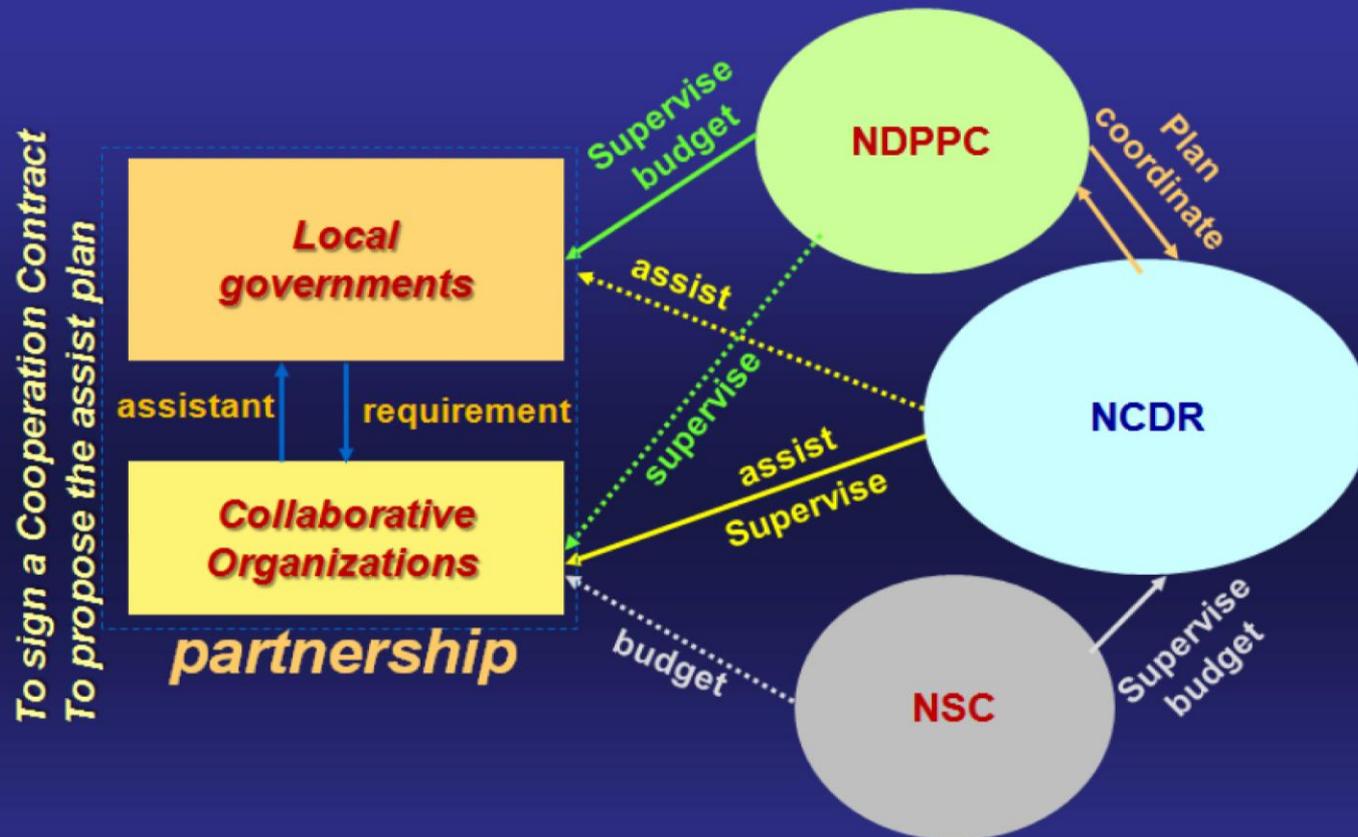
Framework Mechanism against Disaster in Taiwan



Helping Plans for Local Government

- 1. Empower the local-level capability**
- 2. Annual evaluation on implementation**

Mechanism of Empowering the Local

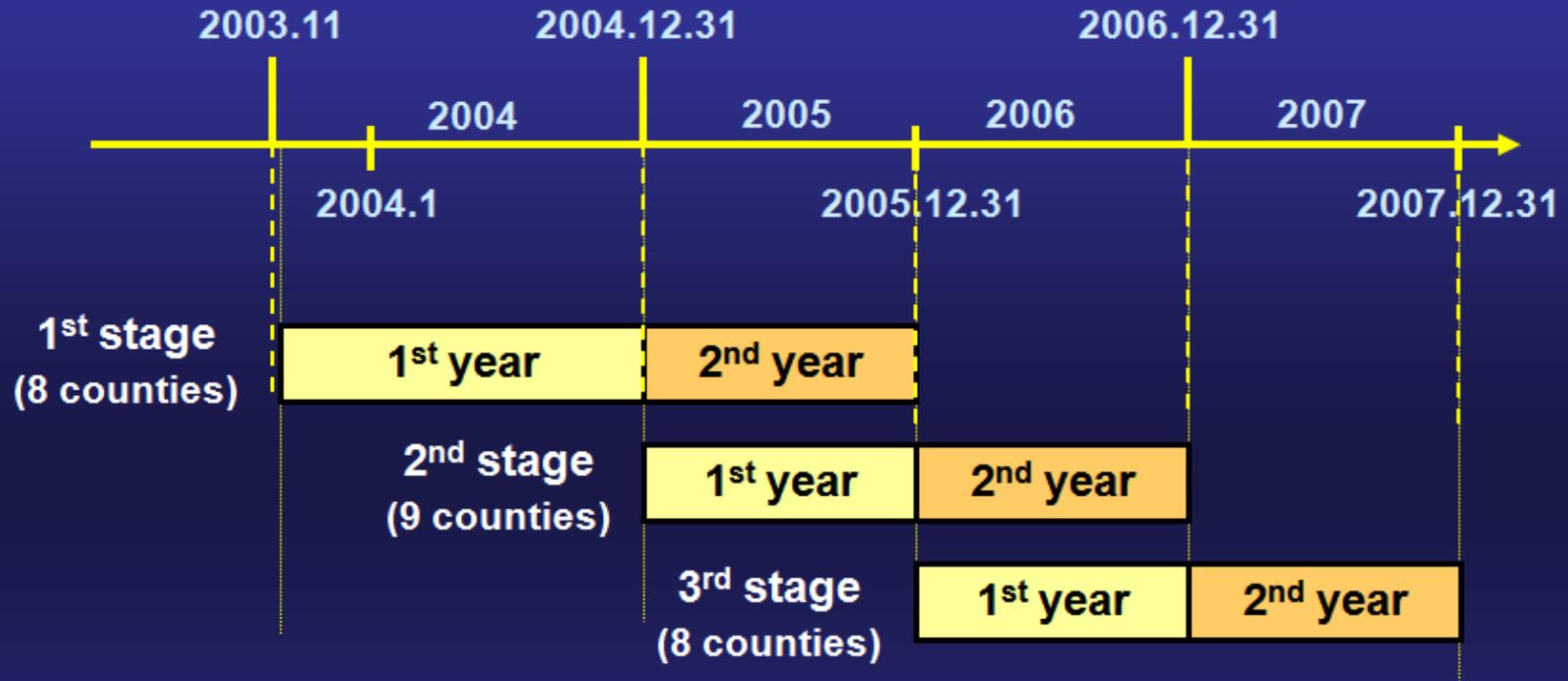


National Disaster Prevention and Response Council (NDPPC)

National Science Council (NSC)

National Science and Technology Center for Disaster Reduction (NCDR)

Phases of implementation



NCDR

Planning, coordination, facilitation, technology support, training, and evaluation

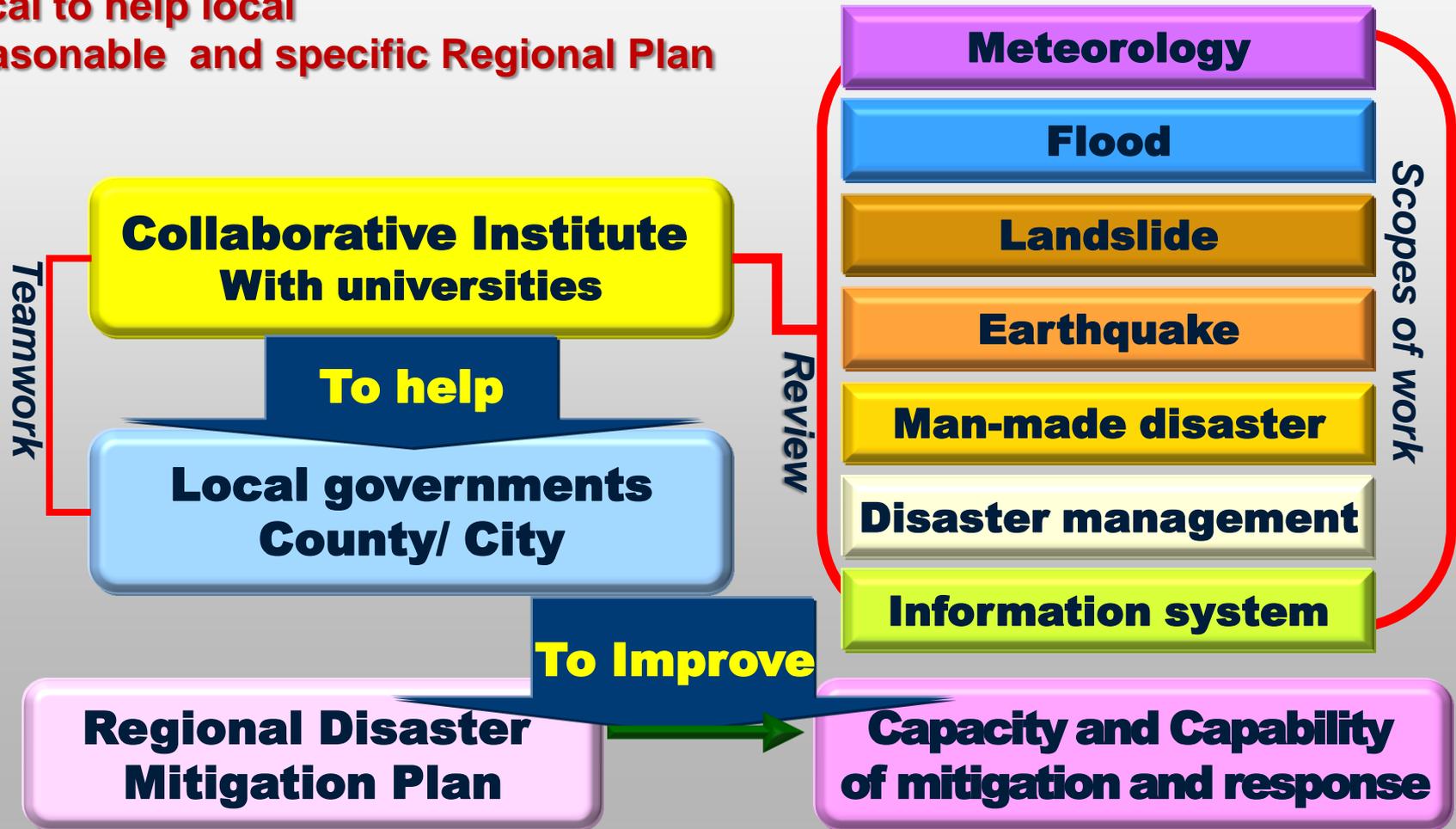
The collaborative organization has to help local govt. develop proposal for the 2nd year.

NSC funding

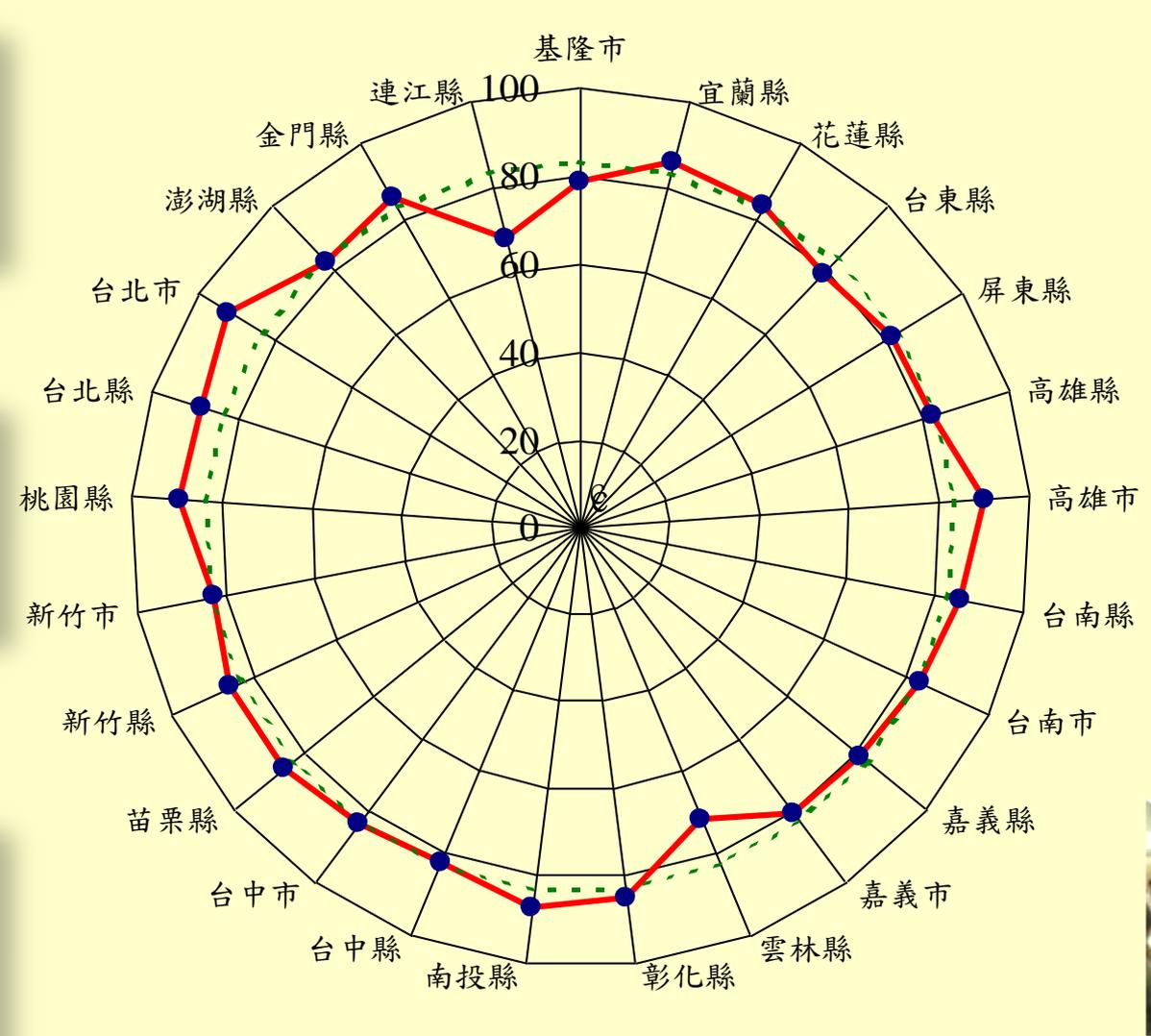
DPRC funding

How and what to do for capacity building

- Local to help local
- Reasonable and specific Regional Plan



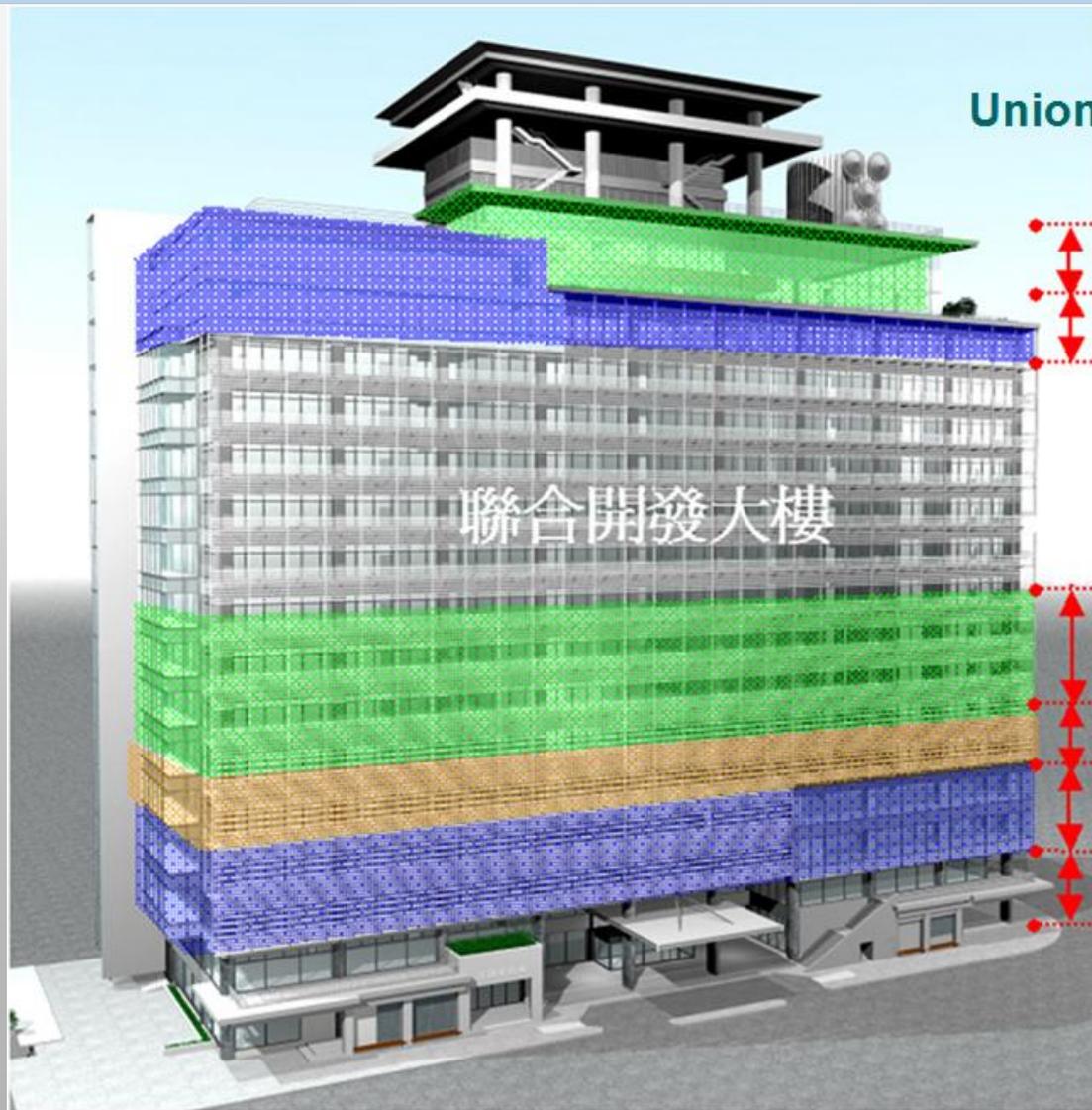
Annual Evaluation on Local Implementation



Goals of Annual Evaluation

- **Indicators of public devotion on disaster reduction and emergency response.**
- **Identification of gaps to be filled.**
- **Providing suggestions for improvement.**
- **Creating interaction and partnership between governments**

Centerpiece of Emergency Response & Disaster Response



Union Development Building

•Communication Center (17F)

•Conference Room (15-16F)

•Architecture and Building
Research Institute (12-13F)

•Aviation Safety Council (11F)

•Airborne Service Corps (10F)

NCDR (9F)

•Nation Fire Agency (6-8F)

•Disaster Prevention and
Protection Commission (5F)

•Emergency Operation Center
(3-4F)



EOC (4F)



Community-Based Strategy

How do we live with risk?

Community, the basic unit of society, is usually affected by natural disasters first and directly.

Community-Based Strategy

- **Community residents are the executors.**
- **Through various activities to encourages participation**
- **Provide needed knowledge and resources.**



discussion



workshop



lecture



education



meeting



parties



field survey



mapping



training



training



exercise

Participatory Process to enroot community



Field survey record

泉安社區實地踏勘活動

組名：橘子組

姓名：陳小莉

日期：2005/12/20

天氣：



踏勘筆記

- 1 往山上的路靠溪邊側沒有護欄，晚上走不安全。
- 2 路面龜裂、路基掏空。
- 3 雜草、垃圾卡住橋孔，橋面有違章建築可能會妨礙排水。
- 4 水、土石和泥巴都從對面的山，直接沖進來的。
- 5 有獨居老人單獨住在土角厝。



Working together with community residents



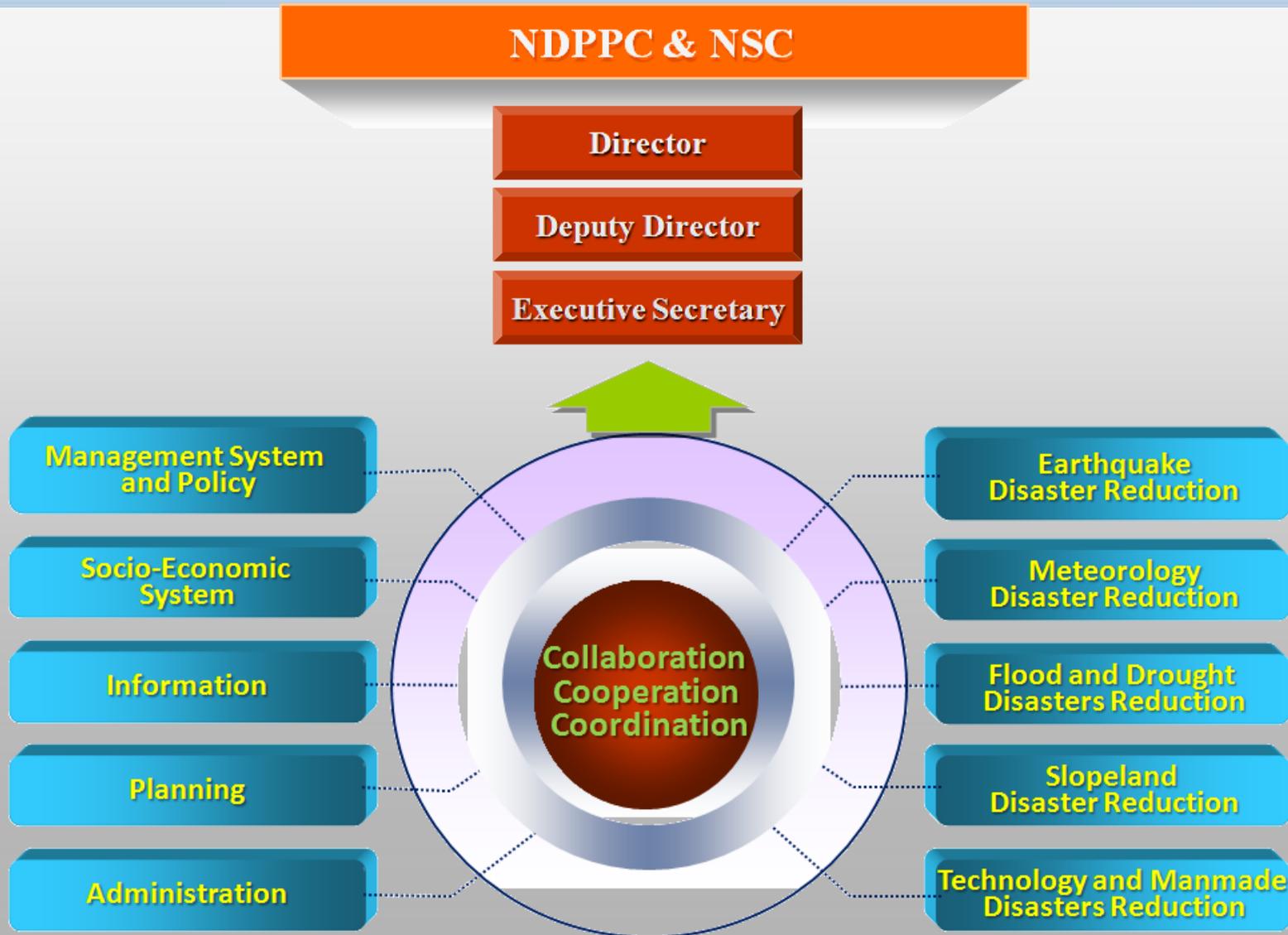
Participation by all sectors



Application of Technology on Disaster Management

End-to-End systems to provide timely solutions

Organizational Chart of NCDR



NCDR major functions

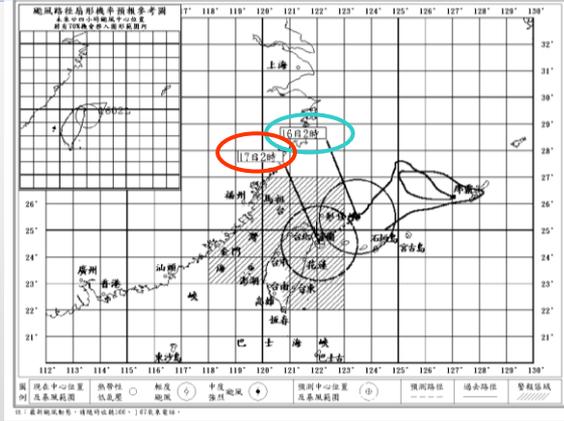
- Suggestion for policy & legislation
- Implementation & promotion of research results

- National library on disaster reduction
- National Information and database center

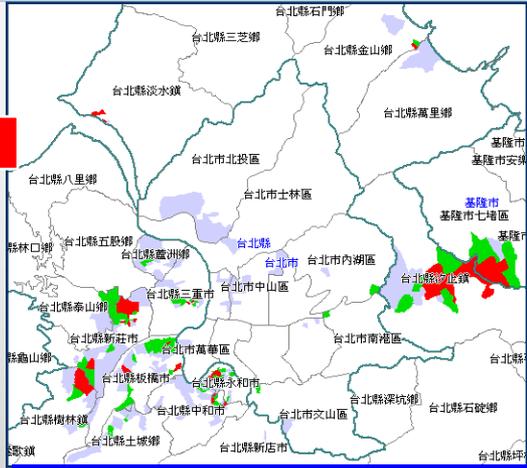
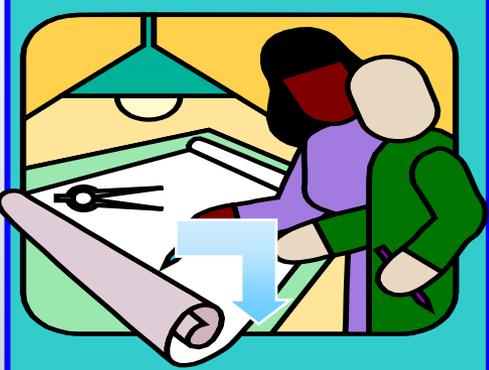
- Emergency response support together with government agencies
- Post-disaster survey

- International collaboration
- Training and education for all levels from primary schools to adults.

Application of Integrated Information System



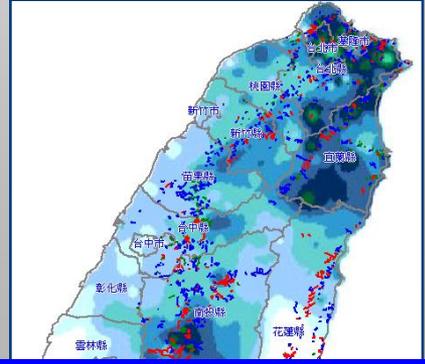
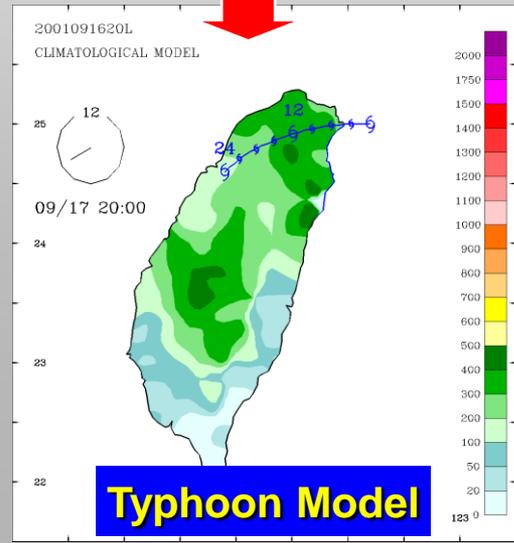
**CEOC
Assessment Group**



Monitor & Forecasting of CWB

Inundation potential areas

**Evaluate the locations & scales of hazards
Early Warning and Evacuating**



Composition of Integrated Information System (For Typhoon, Flood and Landslide)

Monitoring Information input

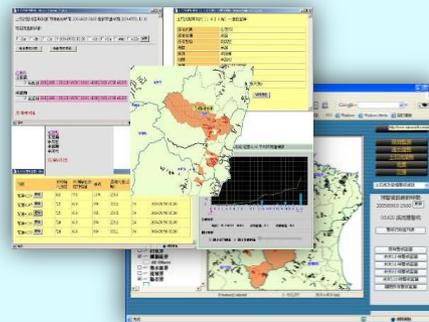


Rain gauge Data



Radar Reflection

Analysis Technology Application



Landslide Disaster



Flood Disaster

Demonstration Technology Application



Web Display Board



**Application of
Google Earth**

Display of Disaster Information in 3D Google Earth



Comparison of Impacts of Recent Typhoon Events

Typhoon Event	Maximum hourly Rainfall (mm/hr)	Total Accumulated Rainfall (mm)	Landslide & Debris Flow Occurrence	Evacuation (Person)	Ceased and Missing (Person)
2001.7.28 Toraji	147	757	673	----	214
2001.9.17 Nari	142	1,462	475	24,000	104
2004.6.30 Mindulle	167	2,005	1,023	9,500	41
2005.7.18 Haitang	177	2,124	605	1,208	15
2005.9.1 Talim	119	766	37	1207	6
2005.10.2 LongWang	154	776	7	945	2

Decreasing of victims



UN EWC III, Bonn
2006.3.27-29



Passive Rescue
(Toraji)



Active assessment and evacuation
(Nari, Midulle, Haitang, Talim and LongWang)

Conclusions

Conclusions

1

**Coordination
plus
response**

*Consensus on the rapid response originating from the efficient and effective deployment including **public and private sectors***

2

**Information
through
Facilitation**

*Platform for **information exchange to cross boundaries** and provide abundant references on reduction, preparedness, response, recovery*

3

**Training
by
Experience**

*Specific training courses provide by economies to cover regional disasters with **the best practice sharing** from experience*

4

**Technology
with
Management**

***Development and sharing of technology** to ensure the better understanding of hazard distribution and provide directions for disaster reduction*

Future Vision

Sustainability & Prosperity

Technology

Strategy

Policy

Coordination

Determination

Community

Academic

Ministry

Local
Government

Central
Government

Learn from Disasters

The End

Thanks for your attention